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New records and new species of marine molluscs (Gastropoda, Caenogastropoda: Rissoidae; Cingulopsidae; Barleeidae; Tjaernoeiidae) from Mauritania and Senegal

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Some species of marine micromolluscs of the families Rissoidae, Cingulopsidae, Barleeidae, and Tjaernoeiidae from West Africa (Mauritania and Senegal) are studied. New information on the following taxa is reported: *Setia nomeae, Eatonina matildae, Barleeia minuscula* (which is considered a valid species) and *Tjaernoeia exquisita*. Four new species belonging to the genera *Setia* (1), *Crisilla* (1) and *Eatonina* (2) are described.

Key words: Gastropoda, Caenogastropoda, Rissoidae, *Setia, Crisilla,* Cingulopsidae, *Eatonina,* Barleeidae, *Barleeia,* Tjaernoeiidae, *Tjaernoeia,* taxonomy, West Africa.

INTRODUCTION

For many years West African molluscs have been studied and described, but priority was always given to those of large size. Only recently, very small molluscs have come to the attention of some authors. They are now better known but many of them are still awaiting study. Concerning the Rissoidae in the study area and nearby, we must mention the papers of Verduin (1984), Amati (1987), Ponder (1989), Gofas (1995), Giannuzzi-Savelli et al. (1996), and Ardovini & Cossignani (2004), among others.

MATERIAL AND METHODS

In some trips of the authors to Dakar, Senegal, in 2002 and 2003, numerous sediments of beach drift and small live species were collected. Additional material of sediments was loaned by Jacques Pelorce from 2001-2003. This was studied and compared with material from Mauritania, visited by the senior author in 1996 in company of José Templado and Federico Rubio. From all this material from the two countries, we here present some records and new species.

Abbreviations: AMNH, American Museum of Natural History, New York; BMNH, The Natural History Museum, London; CER, collection of E. Rolán, to be deposited in the Museo de Historia Natural "Luis Iglesias", Santiago de Compostela; CFS, collection of Frank Swinnen, Belgium; CJH, collection of J. María Hernández, Gran Canaria; MNCN, Museo Nacional de Ciencias Naturales, Madrid; MNHN, Muséum National d'Histoire Naturelle, Paris; USNM, United States of Natural History, Washington.

The number of shells that could be studied is indicated after the collection code.

SYSTEMATIC PART

Rissoidae Gray, 1847

Setia H. Adams & A. Adams, 1854

Type species. — *Rissoa pulcherrima* Jeffreys, 1848, by subsequent designation.

Setia nomeae Moolenbeek & Piersma, 1990 (figs 16-19)

Setia nomea Moolenbeek & Piersma, 1990: 31-33, figs 1-4.

Material examined. — Mauritania: some hundreds of specimens and shells from Baie de l'Etoile, Nouadibou and from Banc d'Arguin, between intertidal and 4-6 m (CER). Senegal: some hundreds of shells from different areas of Dakar, between 5-30 m (CER).

Description. — This species was described by Moolenbeek & Piersma (1990) from Mauritania. The authors presented a small variability in the photographs and one drawing. Now we show photographs of some shells (figs 16-18) and a protoconch (fig. 19). The protoconch has spiral cords and a diameter of about 300 μm. Morphologically the species is very variable. The shells are more or less elongate. The colour may be uniform or not, varying from whitish-cream to dark brown, sometimes with bands. The sculpture varies from almost smooth to numerous and prominent spiral cordlets. Shells from Mauritania are more uniform in sculpture. Those from Senegal have more frequently some cordlets more prominent at the periphery of the last whorl.

Distribution. — Known from Mauritania and Senegal.

Remarks. — This species is very common in Mauritania and in Senegal, Dakar.

The inclusion in the genera *Setia* or *Crisilla* is open to doubt and should be the object of a future study.

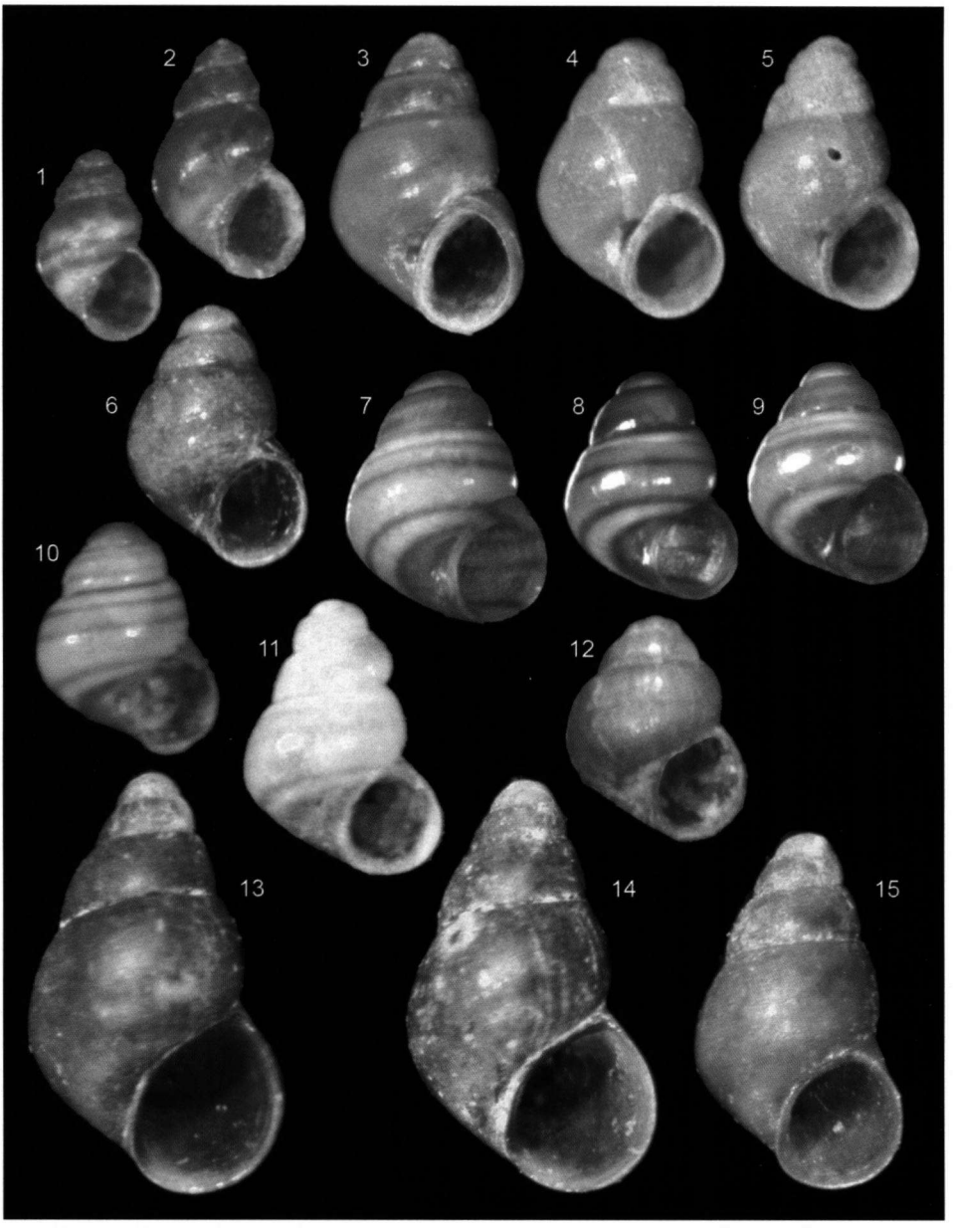
Setia impolite spec. nov. (figs 20-23)

Material examined (paratypes, unless indicated otherwise). — Mauritania, Nouadhibou, Baie de l'Etoile; intertidal (MNCN 15.05/46996/holotype, fig. 20; AMNH /1; BMNH /1; CER/2; CJH/1; MNHN/1, fig. 21; USNM/ 1). Senegal, Dakar, 20-30 m (CER /11 [no paratypes, not from the type locality]).

Description. — Shell small (figs 20, 21), fragile, ovoid, with well marked suture, whitish. Protoconch (fig. 22) with one smooth whorl and a diameter of about 300 μm; nucleus with a diameter of 115 μm. Under high magnification a vague spiral sculpture of lines or nodules can be seen (fig. 23). Teleoconch with 2 or a little more whorls, which increase quickly in size. Periphery rounded; aperture almost circular, peristome continuous, sharp, narrowly contacting the previous whorl. Umbilicus evident, but slightly covered by the aperture.

Dimensions: the largest shells reach a little more than 2 mm.

Distribution. — Known from Mauritania, Nouadhibou, Baie de l'Etoile, and Senegal,



Figs **1-15. 1, 2,** *Crisilla senegalensis* spec. nov., paratypes, Senegal, Dakar, Madeleines (MNHN), H. 0.7, 1.3 mm. **3-6,** *Eatonina fuscoelongata* spec. nov., Senegal, Dakar; **3,** holotype (MNCN), H. 1.3 mm; **4-6,** paratypes (CER), H. 1.2, 1.1, 1.0 mm. **7-11,** *Eatonina ordofasciarum* spec. nov., Senegal, Ðakar; **7,** holotype (MNCN), H. 1.0 mm; **8-10,** paratypes, H. 0.9, 0.8, 0.9 mm (MNHN), **11,** deformed shell, 0.95 mm (CER). **12,** *Eatonina* cf. *matildae,* H. 0.9 mm, Senegal, Dakar (CER). **13, 14,** *Barleeia unifasciata,* small specimens, both H. 2.2 mm, Senegal, Dakar (CER). **15,** *Barleeia minuscula,* large specimen, Senegal, Dakar, H. 1.9 mm (CER).

Dakar.

Remarks. — The shells of most of the Mediterranean species considered in this genus (see Verduin, 1984; Giannuzzi-Savelli et al., 1996) are more elongate, with a less marked suture, and have spirally disposed brown rectangles as in *S. aartseni* (Verduin, 1984), *S. amabilis* (Locard, 1886), *S. slikorum* (Verduin, 1984), etc. Only *S. bruggeni* (Verduin, 1984) and *S. lacourti* (Verduin, 1984) have some similarity but are larger and more transparent, with a smaller umbilicus.

Etymology. — The specific name is the Latin word "impolite" which means "simple, without ornamentation".

Crisilla Monterosato, 1917

Type species. — *Turbo semistriatus* Montagu, 1808, by monotypy. Recent, Europe.

Diagnosis: see Ponder (1985).

Crisilla senegalensis spec. nov. (figs 1, 2, 24-28)

Material examined (paratypes, unless indicated otherwise). — Senegal, Dakar, 30 m (MNCN 15.05/46997/holotype, fig. 24; AMNH/2; CER/24; CFS/1; CJH/2; MNHN/2, figs 1, 2; USNM/2). Same locality, but no paratypes (material in poor condition): CER/2 shells, 3 fragments.

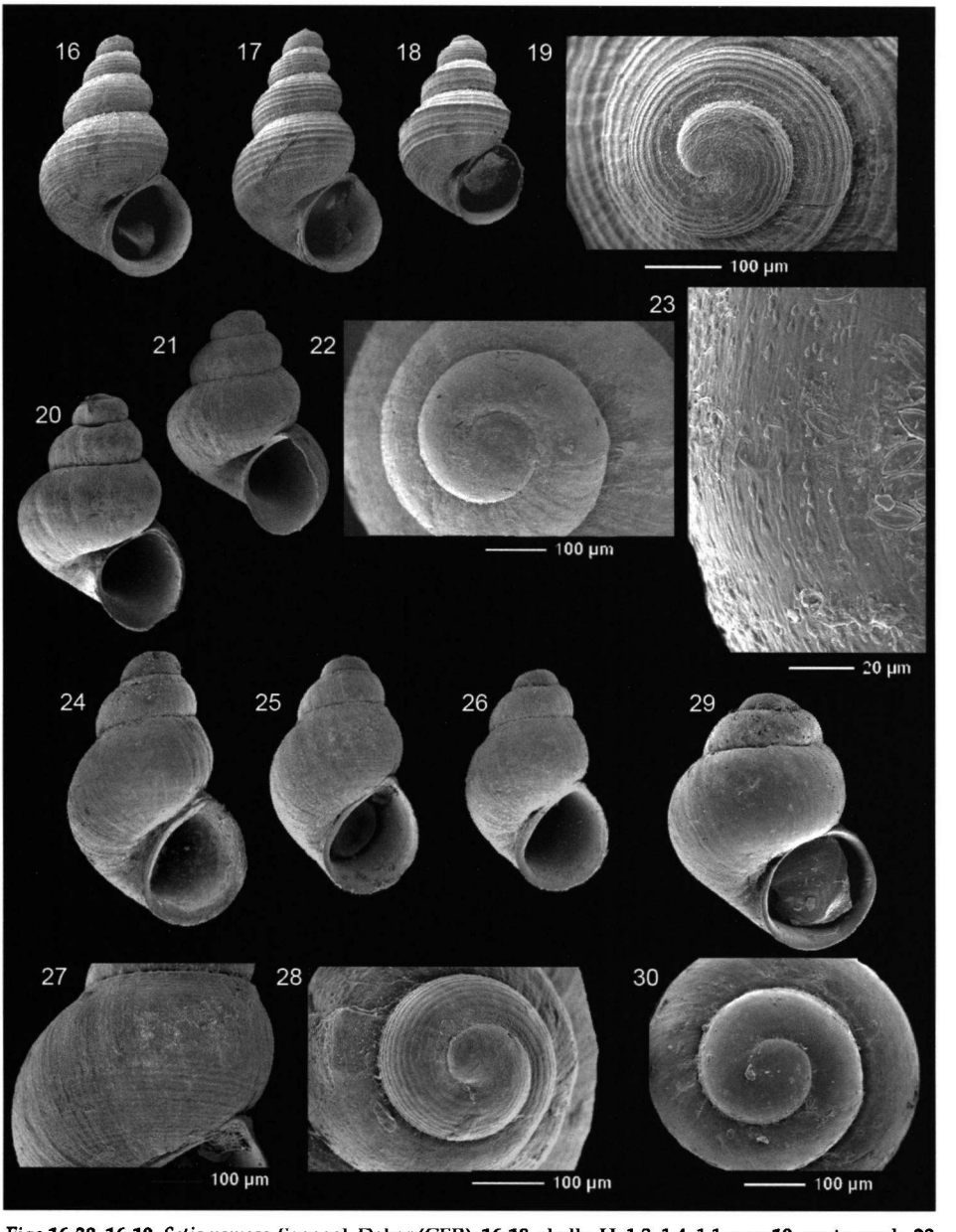
Description. — Shell (figs 1, 2, 24-26) small, ovoid elongate, fragile, last whorl representing ¾ or more of its height; colour brownish, sometimes with white bands on the last whorl and always with some white blotches on the end of the spire. Protoconch (fig 28) of 1¼ smooth whorls and about 330 μm in diameter; the nucleus is of 100 μm; the protoconch colour is light brown like the teleoconch. The teleoconch has nearly 3 whorls in largest specimens and only two in the smaller ones; these whorls are slightly convex, rounded on the periphery of the last whorl. The suture is well marked. The whorls apparently are smooth but, under high magnification, prosocline growth lines and tiny spiral threads can be seen (fig. 27). Aperture ovoid, peristome continuous and narrow. Columella curved and opisthocline. Umbilicus like a narrow fissure or wider. The contact of the aperture with the previous whorl may be reduced to a small area at its upper part.

Dimensions: holotype 1.09 × 0.69 mm; other shells smaller, about 0.80 mm high.

Distribution. — Only known from Dakar, Senegal.

Remarks. — The genus *Crisilla* includes species of two groups: one corresponds to the type species, *Crisilla semistriata* (Montagu, 1808), with shells of about 2-3 mm, rather solid, with axial and spiral sculpture forming a reticulate pattern, the protoconch usually sculptured with lines and tubercles, or zigzagging lines. The second group is formed by shells which are smaller, more elongate and fragile, usually having more or less clear spiral but no axial sculpture, the protoconch spirally sculptured. In this group we must include *Crisilla perminima* (Manzoni, 1868) and *C. iunoniae* (Palazzi, 1988) from the Canary Islands, and all those described from the Cape Verde Archipelago by Templado & Rolán (1993). *Crisilla senegalensis* spec. nov. must be included in this second group. It should be compared to the following species:

C. perminima (Manzoni, 1868), from Madeira, is more irregularly striated on the last whorl, the colour is chesnut-violet; the protoconch has flat spiral areas separated by threads instead of grooves.



Figs **16-30. 16-19,** *Setia nomeae,* Senegal, Dakar (CER); **16-18,** shells, H. 1.3, 1.4, 1.1 mm; **19,** protoconch. **20-23,** *Setia impolite* spec. nov., Mauritania, Baie de l'Etoile, Nouadhibou; **20,** holotype (MNCN), H. 2.1 mm; **21,** paratype, H. 1.97 mm (MNHN); **22,** protoconch; **23,** detail. **24-28,** *Crisilla senegalensis* spec. nov., Senegal, Dakar; **24,** holotype (MNCN), H. 1.06 mm; **25, 26,** paratypes (CER), H. 0.93, 0.87 mm; **27,** detail of the microsculpture of fig. 25; **28,** protoconch of a paratype (CER). **29, 30,** *Eatonina* cf. *matildae,* Senegal, Dakar; **29,** shell (CER), H. 0.8 mm; **30,** protoconch.

C. iunoniae Palazzi, 1988, from Madeira, is a little larger, the protoconch is wider, the spiral striae are larger, more separated at the base, and finer on the upper part of the whorl. Its pattern is formed by blotches.

C. alvarezi Templado & Rolán, 1993, from the Cape Verde Archipelago, is more elongate, the striae are fewer and more separate, the pattern is formed by bands of spots; the protoconch has a sculpture of more separated cords.

C. morenoi Templado & Rolán, 1993, from the Cape Verde Archipelago, is also narrower, without spiral striae on the teleoconch; the protoconch has spiral rows of pits.

C. orteai Templado & Rolán, 1993, from the Cape Verde Archipelago, is narrower, with white colour on the last whorl, with spiral striae on the teleoconch which are more separate and less numerous; the protoconch has more widely spaced spiral cords.

C. vidali Templado & Rolán, 1993, from the Cape Verde Archipelago, has deep and regular striae delimiting spiral cords on the last whorl, the colour is formed by brown bands; the protoconch has well separated spiral cords.

Etymology. — The name is after the country in which the species was discovered.

Cingulopsidae Fretter & Patil, 1958

Eatonina Thiele, 1912

Type species. — *Eatoniella (Eatonina) pusilla* Thiele, 1912, by original designation.

Diagnosis: see Ponder & Yoo (1980), Ponder (1989) and Rubio & Rodríguez Babío (1995).

Eatonina matildae Rubio & Rodríguez Babío, 1995 (figs 12, 29, 30)

Material examined. — Mauritania: numerous specimens in Baie de l'Etoile, Nouadhibou, intertidal (CER). Senegal: 6 s, Dakar (CER).

Description. — See Rubio & Rodríguez Babío (1995).

Distribution. — Known from Gibraltar Strait, Mauritania and Senegal.

Remarks. — The material of this species from Mauritania is typical, with a brown apex and lighter shell. In Senegal the shells (figs 12, 29) are darker and are found sympatrically with those of the two species described below. The protoconch (fig. 30) has only one whorl.

With the present record, the distribution area of this species is shown to include Senegal.

Eatonina fuscoelongata spec. nov. (figs 3-6, 31-34)

Material examined (paratypes, unless indicated otherwise). — Senegal, Dakar, 30 m (MNCN 15.05/46998/holotype, fig 31; AMNH/2; BMNH/2; CER /70 (figs 4-6, 32, 33); CJH/2; MNHN/2, USNM/2. Senegal, Dakar, south of Gorée, 8 m (CER/4 [no paratypes, in bad condition]).

Description. — Shell (figs 3-6, 31-33) small, ovoid elongate, solid, last whorl 2/3 or more of total height, colour uniformly brownish. Protoconch (fig. 34) of 1¼ whorls and

about 310 ²m in diameter; nucleus smooth, measuring about 80 ²m. The protoconch is brown. The teleoconch has between 2 and 3 whorls which are almost flat; the suture is scarcely marked. The whorls are totally smooth. Aperture slightly ovoid, peristome continuous and not adherent to the previous whorl. Columella slightly curved to the right and opisthocline. Umbilicus always present, at least as a wide fissure.

Dimensions: holotype 1.3 mm high; most shells similar or slightly smaller.

Distribution. — Only known from Senegal, Dakar.

Remarks. — The first impression on seeing the shells of *E. fuscoelongata* spec. nov. is that it is a *Barleeia*. But no species of this genus is so small in West Africa (Gofas, 1995) and also the protoconch of the Barleeidae has a microsculpture of regular, spirally-arranged pits (Ponder, 1983) while that of *E. fuscoelongata* is smooth. Besides, the smallest *Barleeia* of Europe and West Africa have no umbilicus.

The most similar species is *Eatonina martae* Rolán & Templado, 1993, from the Cape Verde Archipelago, but that species is smaller, more fragile, the profile is more conical and sharply pointed, the colour is uniform but paler at the apex and usually there is a subsutural darker band, sometimes with white lines; its aperture is rounded rather than ovoid (see Templado & Rolán, 1993).

Etymology. — The specific name alludes to the brown colour and the more elongated shell.

Eatonina ordofasciarum spec. nov. (figs 7-11, 35)

Material examined (paratypes, unless indicated otherwise). — Senegal, Dakar, 30 m (MNCN 15.05/46999/holotype, fig 7; AMNH/2; BMNH/2; CER /85; CJH/10; MNHN/3 (figs 8-10), USNM/2. Senegal, Dakar (no paratypes, not from the type locality); south of Gorée, 30-40 m (CER/15); Madeleines, 20 m (CER/3); Cap Vert, 35 m (CER/3); Almadies, 25 m (CER/10).

Description. — Shell (figs 7-11) small, ovoid elongate, relatively fragile, last whorl being 2/3 or more of total height, background colour uniform, transparent whitish, with two brown bands on the penultimate whorl and four on the last whorl, the two lower placed below the periphery and the lowest around the umbilicus. Protoconch (fig. 35) of almost 1¼ whorls and about 290 ²m in diameter; the nucleus is smooth with about 110 ²m; protoconch whitish or light brownish. The teleoconch has 2½ whorls which are rounded; the suture is clearly marked. The whorls are totally smooth. Aperture ovoid, almost circular; peristome continuous with a short area adhering to the previous whorl. Columella slightly curved and opisthocline. Umbilicus narrow but clear.

Dimensions: holotype 1.0 mm high; some shells with a more elongate spire reach 1.2 mm.

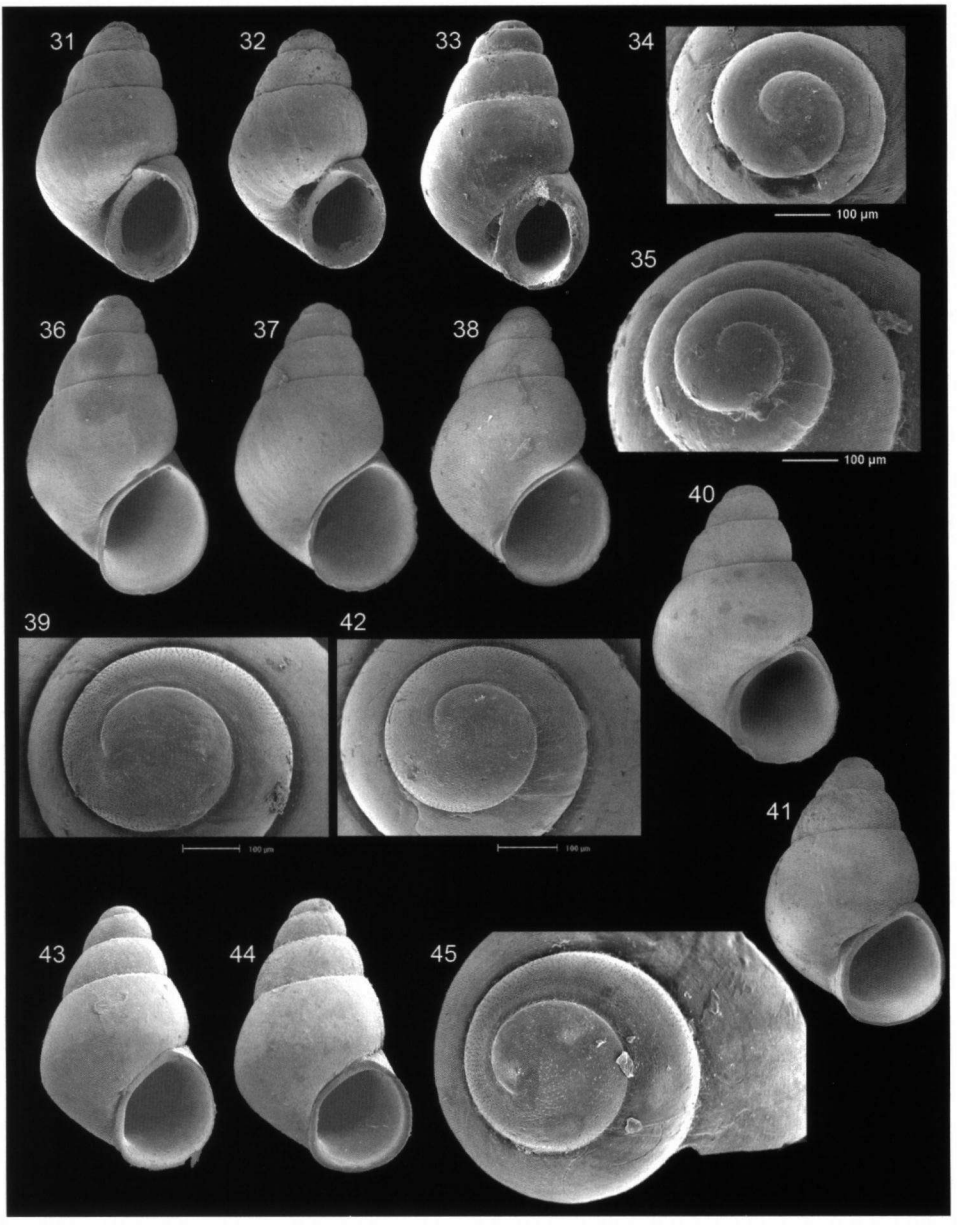
Variations: in spite of the usual uniformity in form and pattern, some shells are almost albinistic; the spire is sometimes abnormally elongate (fig. 11).

Distribution. — Only known from Senegal, Dakar.

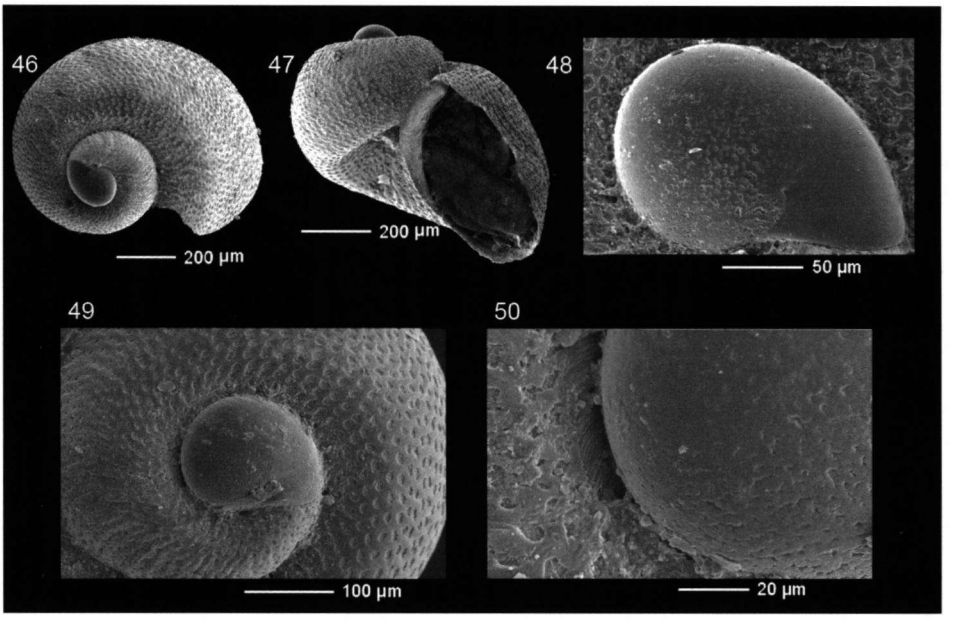
Remarks. — This species may be separated from the European species by the following characters:

E. fulgida (J. Adams, 1797) from the Mediterranean and Atlantic is variable but can have different colour bands (as shown in Rubio & Rodríguez Babío, 1995). In Dakar, some specimens compatible with this species morph were found, in which case, both species could be sympatric.

E. pumila (Monterosato, 1884) has a uniform pattern, with three bands, sometimes four (one sutural): the uppermost is close to the suture and separate from the lower one.



Figs **31-45**. **31-34**, *Eatonina fuscoelongata* spec. nov., Senegal, Dakar; **31**, holotype (MNCN), H. 1.3 mm; **32**, **33**, paratypes (CER), H. 1.16, 1.2 mm; **34**, protoconch of a paratype (CER). **35**, *Eatonina ordofasciarum* spec. nov., protoconch of a paratype (CER). **36-45**. *Barleeia minuscula*; **36-39**, Mauritania, Baie de l'Etoile, Nouadhibou, shells (CER), H. 1.95, 1.85, 1.8 mm, and protoconch; **40-42**, Mauritania, Banc d'Arguin, shells (CER), H. 1.6, 1.58 mm and protoconch; **43-45**, Senegal, Dakar, shells (CER), H. 1.6, 1.5 mm, and protoconch.



Figs **46-50.** *Tjaernoeia exquisita.* **46-48,** shells and protoconch (CER), Ghana, Cape Three Points; **49,** protoconch (CER), Senegal, Dakar; **50,** detail.

In *E. ordofasciarum* there are four bands, the uppermost is not so close to the suture and is near the lower one instead; the third is more separate and is a continuation of the suture. It can be seen sometimes in previous whorls. The lowermost surrounds the umbilicus but is separate.

Eatonina cossurae (Calcara, 1841) has a similar distribution of the bands, but with a different number (five); its shell is more elongate and the size is about 1.5 mm, while the new species is up to 1 mm.

Tubbreva micrometrica (Seguenza, 1862) also has brown spiral bands, but the shell is more elevated.

Etymology. — From the Latin words *ordo* "order" and *fascia* "bands" alluding the uniform pattern they show.

Barleeiidae Gray, 1857

Barleeia Clark, 1853

Type species. — *Turbo ruber* J. Adams, 1797, non Von Salis, 1793 (= *T. unifasciata* Montagu, 1803), by monotypy. Recent, Atlantic and Mediterranean Sea.

Diagnosis: see Ponder (1983).

Barleeia cf. *minuscula* Monterosato, 1889 (figs 15, 36-45)

Barleeia minuscula Monterosato, 1889: 34.

Material studied. — Mauritania: numerous shells from l'Etoile, Nouadhibou (CER); Senegal numerous shells from Dakar (CER).

Description. — Monterosato (1889) described this species as follows: "*Forme plus petite que le B. rubra (1 ½ mm de longeur), mais a ouverture plus large. Colouration fauve avec deux bands. Ne pas la confondre avec la var. fasciata de B. rubra.*" Gofas (1995) thinks that the species referred to by Monterosato is probably *Coriandria fulgida*.

Remarks. — In the material studied by us there are numerous shells which present some differences with the well-known *B. gougeti* (Michaud, 1830) and *B. unifasciata* (Montagu, 1803), which have been perfectly well described in Gofas (1995). We figure (fig. 15) a larger shell of the species supposed to be *B. minuscula* in comparison with the smallest two of *B. unifasciata* (figs 13, 14). Also, we show material from Mauritania, l'Etoile (figs 36-38), from Banc d'Arguin (figs 40, 41) and from Senegal, Dakar (figs 43, 44). The protoconchs of shells from these populations have slightly more than one whorl, instead of 1½-1¾ as mentioned for *B. unifasciata* in Gofas (1995). Besides, the diameter of the protoconchs in our material is about 350 ²m instead of that mentioned for *B. unifasciata*, i.e. 450-500 ²m. For all these reasons, we are convinced that there is another species, which is different from *B. unifasciata* and smaller than it. Provisionally we assigned to this taxon the name of Monterosato due to its size also coinciding and not as mentioned by Gofas for *B. unifasciata*.

Tjaernoeiidae Warén, 1991

Tjaernoeia Warén & Bouchet, 1988

Type species. — *Fossarus monterosati* Grillo, 1877 (= *Adeorbis imperspicuus* Chaster, 1895), by original designation.

Diagnosis: see Warén & Bouchet (1988).

Tjaernoeia exquisita (Jeffreys, 1883) (figs 46-50)

Adeorbis exquisitus Jeffreys, 1883: 399, pl. 16 fig. 8.

Remarks. — This species was described and recorded from several European localities by Warén (1991). Rolán & Rubio (1997) recorded it from Angola and mentioned the possibility that the species may have a bipolar distribution. However, it has been collected recently in the Cape Verde Archipelago (Rolán, 2005), Ghana (figs 46-48) and Senegal (figs 49, 50) showing that the species extends over the entire area. It is not bipolar. The lack of records in many areas may be due to the very small size of this species. We figure the protoconch (figs 49, 50), which is the more important differential character to separate it from other congeneric species.

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